CLAIMS

1. A method comprising:

generating a set of Steiner trees and paths from an undirected graph of vertices representing terminal and Steiner nodes; and

merging the Steiner trees and the paths to produce linked and edge-disjoint S-Steiner trees such that if a subset S of the vertices is k edge-connected, then there are $\alpha_{|S|}k$ edge-disjoint Steiner trees for S, where α_s is at minimum a sequence that tends to an asymptotic approximation factor of $|S|/4$ as s tends to infinity.

2. A method as recited in claim 1, wherein generating further comprises analyzing an undirected graph of vertices representing terminal and Steiner nodes to produce a Steiner Tree between two terminal nodes of the terminal nodes, the two terminal nodes now being processed nodes.

3. A method as recited in claim 1, wherein generating further comprises:

for each unprocessed vertex of the vertices, identifying one or more respective paths from the unprocessed vertex to each of a set of processed terminal vertices of the vertices to inductively grow the undirected graph by creating the Steiner trees, the unprocessed vertex now being a processed vertex;

for each unprocessed vertex of the vertices, identifying one or more respective paths from the unprocessed vertex to each of a set of processed terminal vertices of the vertices to inductively grow the undirected graph by creating the Steiner trees, the unprocessed vertex now being a processed vertex; and

for each Steiner tree:

determining if a path of the paths shares an edge with the Steiner tree; and

responsive to determining that the path shares the edge, shortcutting the path to a vertex of the Steiner tree by removing a portion of the path that is subsequent to the edge, each Steiner tree being used to shortcut a path of the paths being a path-tree.

4. A method as recited in claim 1, wherein the vertices represent respective sending, receiving, and router network nodes, and wherein the method further comprises:

receiving a set of requests for streaming data from at least a subset of vertices of S, the at least a subset representing receiving network nodes;

identifying one or more of the edge-disjoint Steiner trees that comprise each of the at least a subset; and

multicasting the streaming data to the at least a subset over communication pathways identified by the one or more of the edge-disjoint Steiner trees.

5. A method as recited in claim 1, wherein the substantially $\alpha_{|S|}k$ edge-disjoint Steiner trees for S are at minimum the following:

$$SOL_p(x) = x_0 + x_p - \left\lceil (x_0 - \sum_{i=p+1}^{s} ix_i)/p \right\rceil + \sum_{i=1}^{p-1} x_i$$

$$= \left\lfloor \frac{p-1}{p} x_0 + \sum_{i=1}^{p} x_i + \sum_{i=p+1}^{s} \frac{i}{p} x_i \right\rfloor,$$

wherein x_0 represents the Steiner trees not used to shortcut any path, x_0 represents Steiner trees used to shortcut a path,

6. A method as recited in claim 5, wherein p is a number such that $\sum_{i=p+1}^{s} ix_i < x_0 \leq \sum_{i=p}^{s} ix_i$.

7. A method as recited in claim 5, wherein if $x_0 \leq sx_s$, $p = s$.

8. A method as recited in claim 5, wherein if $\sum_{i=1}^{s} ix_i < x_0$, $p = 0$.

9. A computer-readable medium comprising computer-executable instructions for packing Steiner trees, the computer-executable instructions comprising instructions for:

generating a set of Steiner trees and paths from an undirected graph of vertices representing terminal and Steiner nodes; and

merging the Steiner trees and the paths to produce linked and edge-disjoint S-Steiner trees such that if a subset S of the vertices is k edge-connected, then at minimum there are $\alpha_{|S|}k$ edge-disjoint Steiner trees for S, where α_s is a sequence that tends to an asymptotic approximation factor of $|S|/4$ as s tends to infinity.

10. A computer-readable medium as recited in claim 9, wherein the computer-executable instructions for generating further comprise instructions for analyzing an undirected graph of vertices representing terminal and Steiner nodes to produce a Steiner Tree between two terminal nodes of the terminal nodes, the two terminal nodes now being processed nodes.

11. A computer-readable medium as recited in claim 9, wherein the computer-executable instructions for generating further comprise instructions for:

for each unprocessed vertex of the vertices, identifying one or more respective paths from the unprocessed vertex to each of a set of processed terminal vertices of the vertices to inductively grow the undirected graph by creating the Steiner trees, the unprocessed vertex now being a processed vertex;

for each unprocessed vertex of the vertices, identifying one or more respective paths from the unprocessed vertex to each of a set of processed terminal vertices of the vertices to inductively grow the undirected graph by creating the Steiner trees, the unprocessed vertex now being a processed vertex; and

for each Steiner tree:

determining if a path of the paths shares an edge with the Steiner tree; and

responsive to determining that the path shares the edge, shortcutting the path to a vertex of the Steiner tree by removing a portion of the path that is subsequent to the edge, each Steiner tree being used to shortcut a path of the paths being a path-tree.

12. A computer-readable medium as recited in claim 9, wherein the vertices represent respective sending, receiving, and router network nodes, and wherein the computer-executable instructions further comprise instructions for:

receiving a set of requests for streaming data from at least a subset of vertices of *S*, the at least a subset representing receiving network nodes;

identifying one or more of the edge-disjoint Steiner trees that comprise each of the at least a subset; and

multicasting the streaming data to the at least a subset over communication pathways identified by the one or more of the edge-disjoint Steiner trees.

13. A computer-readable medium as recited in claim 9, wherein the $\alpha_{|S|}k$ edge-disjoint Steiner trees for *S* are at minimum based on the following:

$$SOL_p(x) = x_0 + x_p - \left\lceil (x_0 - \sum_{i=p+1}^{s} ix_i)/p \right\rceil + \sum_{i=1}^{p-1} x_i$$
$$= \left\lfloor \frac{p-1}{p} x_0 + \sum_{i=1}^{p} x_i + \sum_{i=p+1}^{s} \frac{i}{p} x_i \right\rfloor,$$

wherein x_0 represents the Steiner trees not used to shortcut any path, x_0 represents Steiner trees used to shortcut a path.

14. A computer-readable medium as recited in claim 13, wherein *p* is a number such that $\sum_{i=p+1}^{s} ix_i < x_0 \leq \sum_{i=p}^{s} ix_i$.

15. A computer-readable medium as recited in claim 9, wherein if $x_0 \leq sx_s$, $p = s$.

16. A computer-readable medium as recited in claim 9, wherein if $\sum_{i=1}^{s} ix_i < x_0$, $p = 0$.

17. A computing device comprising:

a processor;

a memory coupled to the processor, the memory comprising computer instructions executable by the processor for:

generating a set of Steiner trees and paths from an undirected graph of vertices representing terminal and Steiner nodes; and

merging the Steiner trees and the paths to produce linked and edge-disjoint S-Steiner trees such that if a subset S of the vertices is k edge-connected, then at minimum there are $\alpha_{|S|}k$ edge-disjoint Steiner trees for S, where α_s is a sequence that tends to an asymptotic approximation factor of $|S|/4$ as s tends to infinity.

18. A computing device as recited in claim 17, wherein the computer instructions for generating further comprise instructions for analyzing an undirected graph of vertices representing terminal and Steiner nodes to produce a Steiner Tree between two terminal nodes of the terminal nodes, the two terminal nodes now being processed nodes.

19. A computing device as recited in claim 17, wherein the computer instructions for generating further comprise instructions for:

for each unprocessed vertex of the vertices, identifying one or more respective paths from the unprocessed vertex to each of a set of processed terminal vertices of the vertices to inductively grow the undirected graph by creating the Steiner trees, the unprocessed vertex now being a processed vertex;

for each unprocessed vertex of the vertices, identifying one or more respective paths from the unprocessed vertex to each of a set of processed terminal vertices of the vertices to inductively grow the undirected graph by creating the Steiner trees, the unprocessed vertex now being a processed vertex; and

for each Steiner tree:

determining if a path of the paths shares an edge with the Steiner tree; and

responsive to determining that the path shares the edge, shortcutting the path to a vertex of the Steiner tree by removing a portion of the path that is subsequent to the edge, each Steiner tree being used to shortcut a path of the paths being a path-tree.

20. A computing device as recited in claim 17, wherein the vertices represent respective sending, receiving, and router network nodes, and wherein the computer-executable instructions further comprise instructions for:

receiving a set of requests for streaming data from at least a subset of vertices of *S*, the at least a subset representing receiving network nodes;

identifying one or more of the edge-disjoint Steiner trees that comprise each of the at least a subset; and

multicasting the streaming data to the at least a subset over communication pathways identified by the one or more of the edge-disjoint Steiner trees.

21. A computing device as recited in claim 17, wherein the $\alpha_{|S|}k$ edge-disjoint Steiner trees for *S* are at minimum based on the following:

$$SOL_p(x) = x_0 + x_p - \left\lceil (x_0 - \sum_{i=p+1}^{s} ix_i)/p \right\rceil + \sum_{i=1}^{p-1} x_i$$
$$= \left\lfloor \frac{p-1}{p} x_0 + \sum_{i=1}^{p} x_i + \sum_{i=p+1}^{s} \frac{i}{p} x_i \right\rfloor,$$

wherein x_0 represents the Steiner trees not used to shortcut any path, x_0 represents Steiner trees used to shortcut a path,

22. A computing device as recited in claim 21, wherein *p* is a number such that $\sum_{i=p+1}^{s} ix_i < x_0 \le \sum_{i=p}^{s} ix_i$.

23. A computing device as recited in claim 21, wherein if $x_0 \le sx_s$, $p = s$.

24. A computing device as recited in claim 21, wherein if $\sum_{i=1}^{s} ix_i < x_0$, $p = 0$.

25. A computing device comprising:

means for generating a set of Steiner trees and paths from an undirected graph of vertices representing terminal and Steiner nodes; and

means for merging the Steiner trees and the paths to produce linked and edge-disjoint S-Steiner trees such that if a subset S of the vertices is k edge-connected, then at minimum there are substantially $\alpha_{|S|}k$ edge-disjoint Steiner trees for S, where α_s is a sequence that tends to an asymptotic approximation factor of $|S|/4$ as s tends to infinity.

26. A computing device as recited in claim 25, wherein the means for generating further comprise means for analyzing an undirected graph of vertices representing terminal and Steiner nodes to produce a Steiner Tree between two terminal nodes of the terminal nodes, the two terminal nodes now being processed nodes.

27. A computing device as recited in claim 25, wherein the means for generating further comprise:

means for each unprocessed vertex of the vertices, identifying one or more respective paths from the unprocessed vertex to each of a set of processed terminal vertices of the vertices to inductively grow the undirected graph by creating the Steiner trees, the unprocessed vertex now being a processed vertex;

for each unprocessed vertex of the vertices, means for identifying one or more respective paths from the unprocessed vertex to each of a set of processed terminal vertices of the vertices to inductively grow the undirected graph by creating the Steiner trees, the unprocessed vertex now being a processed vertex; and

for each Steiner tree:

means for determining if a path of the paths shares an edge with the Steiner tree; and

responsive to determining that the path shares the edge, means for shortcutting the path to a vertex of the Steiner tree by removing a portion of the path that is subsequent to the edge, each Steiner tree being used to shortcut a path of the paths being a path-tree.

28. A computing device as recited in claim 25, wherein the vertices represent respective sending, receiving, and router network nodes, and further comprising:

means for receiving a set of requests for streaming data from at least a subset of vertices of *S*, the at least a subset representing receiving network nodes;

means for identifying one or more of the edge-disjoint Steiner trees that comprise each of the at least a subset; and

means for multicasting the streaming data to the at least a subset over communication pathways identified by the one or more of the edge-disjoint Steiner trees